

Claims

What is claimed is:

1. An air flow system for facilitating cooling of rack-mounted electronic equipment, the air flow system comprising:

an inlet duct configured to attach to rack-mounted electronic equipment to at least partially cover an air-intake side thereof, and define a supply air flow plenum for directing air from a conditioned air source to the air-intake side of the rack-mounted electronic equipment; and

wherein the inlet duct has a primary, conditioned air inlet at a first end for receiving conditioned air from the conditioned air source, and is tapered from the first end to a second end thereof, with the supply air flow plenum having a varying air flow cross-section, and wherein the inlet duct further comprises an auxiliary room air inlet for providing supplemental room air to the air-intake side of the rack-mounted electronic equipment, the auxiliary room air inlet being disposed closer to the first end of the inlet duct than the second end thereof, thereby facilitating mixing of conditioned air with room air within the supply air flow plenum prior to deliver thereof to the air-intake side of the rack-mounted electronic equipment.

2. The air flow system of claim 1, wherein the auxiliary room air inlet of the inlet duct has an adjustable opening size for controlling an amount of supplemental room air drawn into the supply air flow plenum for mixing with the conditioned air from the conditioned air source.

3. The air flow system of claim 2, wherein the primary, conditioned air inlet is at a lower end of the inlet duct when the inlet duct is attached to the rack-mounted electronic equipment to at least partially cover the air-intake side thereof, and wherein the inlet duct is configured to reside over and seal to a conditioned air outlet in air flow communication with the conditioned air source.

4. The air flow system of claim 3, wherein the conditioned air outlet comprises a perforated floor tile in a data center containing the rack-mounted electronic equipment.

5. The air flow system of claim 1, wherein the inlet duct comprises a first duct of two ducts, and wherein a second duct of the two ducts is configured to attach to the rack-mounted electronic equipment to at least partially cover an air-outlet side thereof, and wherein when the first duct is attached to at least partially cover the air-intake side, the first duct and air-intake side define a supply air flow plenum with a converging air flow cross-section from a lower portion to an upper portion thereof, and wherein when the second duct is attached to at least partially cover the air-outlet side, the second duct and air-outlet side define a return air flow plenum with a diverging air flow cross-section from a lower portion to an upper portion thereof, the second duct having an exhaust opening in the upper portion thereof.

6. The air flow system of claim 5, wherein the first duct and the second duct are identical structures.

7. The air flow system of claim 6, further comprising a reversible attachment mechanism for attaching the identically structured first duct and second duct to the rack-mounted electronic equipment to cover either the air-intake side or the air-outlet side thereof.

8. The air flow system of claim 1, wherein when the inlet duct is attached to the rack-mounted electronic equipment to at least partially cover the air-intake side thereof, the supply air flow plenum defined by the inlet duct and the air-intake side of the rack-mounted electronic equipment has a converging air flow cross-section from the first end of the inlet duct to the second end of the inlet duct.

9. The air flow system of claim 8, wherein the first end of the inlet duct comprises an upper end of the inlet duct when the inlet duct is attached to the rack-mounted electronic equipment to at least partially cover the air-intake side thereof, with the second end of the inlet duct comprising a lower end of the inlet duct.

10. A combined air flow system and rack-mounted electronic equipment apparatus, comprising:

a rack unit comprising a plurality of drawer units each containing an electronic unit, the rack unit being at least partially air cooled and having an air-intake side and an air-outlet side;

an inlet duct attached to the rack unit to at least partially cover the air-intake side thereof, and defining a supply air flow plenum for directing air from a conditioned air source into the air-intake side of the rack unit; and

wherein the inlet duct has a primary, conditioned air inlet at a first end for receiving conditioned air from the conditioned air source, and is tapered from the first end to a second end thereof, with the supply air flow plenum having a varying air flow cross-section, and wherein the inlet duct further includes an auxiliary room air inlet for providing supplemental room air to the air-intake side of the rack unit, the auxiliary room air inlet being disposed closer to the first end of the inlet duct than the second end thereof, thereby facilitating mixing of conditioned air with room air within the supply air flow plenum prior to delivery thereof to the air-intake side of the rack unit.

11. The apparatus of claim 10, wherein the auxiliary room air inlet of the inlet duct has an adjustable opening size for controlling an amount of supplemental room air drawn into the supply air flow plenum for mixing with conditioned air from the conditioned air source.

12. The apparatus of claim 11, wherein the auxiliary room air inlet further comprises a sliding plate, the sliding plate providing adjustable control of the opening size of the auxiliary room air inlet to either increase or decrease an amount of supplemental room air drawn into the supply air flow plenum for mixing with conditioned air from the conditioned air source.

13. The apparatus of claim 10, wherein the inlet duct comprises a first duct of two identical ducts, and wherein a second duct of the two ducts is configured to attach to the rack unit to at least partially cover an air-outlet side thereof, and wherein when the first duct is attached to at least partially cover the air-intake side, the first duct and air-intake side define a supply air flow plenum with a converging air flow cross-section from a lower portion to an upper portion of the first duct, and when the second duct is attached to at least partially cover the air-outlet side, the second duct and air-outlet side define a return air flow plenum with a diverging air flow cross-section from a lower portion to an upper portion thereof, the second duct having an exhaust opening in the upper portion thereof.

14. The apparatus of claim 13, further comprising a reversible attachment mechanism for attaching the identically structured first duct and second duct to the rack unit to cover either the air-intake side or the air-outlet side thereof.

15. The apparatus of claim 10, wherein each drawer unit includes an air moving device for directing air through the drawer unit from the air-intake side to an air-outlet side of the rack unit.

16. The apparatus of claim 10, wherein the supply air flow plenum defined by the inlet duct and the at least partially covered air-intake side of the rack unit has a converging air flow cross-section from the first end of the inlet duct to the second end of the inlet duct.

17. The apparatus of claim 10, wherein the auxiliary room air inlet in the inlet duct is adjacent to the primary, conditioned air inlet in the inlet duct.

18. A method for facilitating cooling of rack-mounted electronic equipment, the method comprising:

providing a duct configured to attach to rack-mounted electronic equipment to at least partially cover an air-intake side thereof, and define a supply air flow plenum having a varying air flow cross-section for directing air from a conditioned air source into the air-intake side of the rack-mounted electronic equipment; and

wherein the providing includes providing a first opening at a first end of the duct for facilitating conditioned air flow from a conditioned air source into the supply air flow plenum for supply to the air-intake side of the rack-mounted electronic equipment, and providing an adjustable second opening in the duct for facilitating supplemental room air flow into the supply air flow plenum for supply to the air-intake side of the rack-mounted electronic equipment, wherein the adjustable second opening is disposed closer to the first end of the duct than a second end of the duct, thereby facilitating mixing of the conditioned air flow with the supplemental room air flow within the supply air flow plenum prior to delivery thereof to the air-intake side of the rack-mounted electronic equipment.

19. The method of claim 18, wherein the providing further comprises providing a reversible attachment mechanism which allows the duct to be attached to the rack-mounted electronic equipment to at least partially cover the air-intake side thereof or an air-outlet side thereof, wherein when attached to at least partially cover the air-intake side thereof, the supply air flow plenum has a converging air flow cross-section from the first end of the duct to the second end, and when attached to at least partially cover the air-outlet side thereof, a return air flow plenum is defined having a diverging cross-section from the second end of the duct to the first end thereof.

20. The method of claim 18, wherein the method further comprises manually or automatically adjusting an opening size of the adjustable second opening in the duct.

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